



UNITED STATES GENERAL SERVICES ADMINISTRATION
FEDERAL CENTER SOUTH MONITORING WELL FC9 AREA
SUPPLEMENTAL SOIL AND GROUNDWATER SAMPLING
FINAL REPORT



Prepared for:
U.S General Services Administration
400 15th Street SW
Auburn, Washington 98001

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Seattle, Washington 98134

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January 7, 2011

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SUMMARY OF FINDINGS

EHSI completed a Supplemental Soil and Groundwater Sampling of the Groundwater Monitoring Well FC9 Area (FC9 Area). The FC9 Area is located within the asphalt-paved parking lot west of the Federal Center South Building 1202. EHSI executed the soil characterization and groundwater well sampling project on behalf GSA in order to address the Federal Center South Voluntary Cleanup Program (VCP) environmental characterization data gaps.

Groundwater monitoring well FC9 was installed by Herrera Environmental Consultants as part of their *Environmental Site Assessment and Ground Water Monitoring, Federal Center South, 4735 East Marginal Way South, Seattle, Washington* project (January 2000).

Part of the Herrera site assessment work for the project included the placement of six soil sample borings for collection of subsurface soil samples to the east of groundwater monitoring well FC9. The samples collected from the six borings were tested for diesel- to heavy oil-range petroleum hydrocarbons. There were three detections of heavy oil-range petroleum hydrocarbons. Two samples (FC9-S4-5 and FC9-S6-5) had measureable concentrations of heavy oil-range petroleum hydrocarbons of 100 and 230 mg/kg (parts per million), respectively. Sample FC9-S2-5 had a measureable concentration of heavy oil-range petroleum hydrocarbons of 2,600 parts per million (ppm). The FC9-S2-5 sample heavy oil-range petroleum hydrocarbons concentration exceeded the Washington State MTCA Method A Soil Cleanup Level for heavy oil-range petroleum hydrocarbons in Unrestricted Land Uses (173-340 WAC).

In order to determine if the FC9-S2-5 sample was indicative of a pocket of undocumented soil contamination, EHSI placed six soil borings around the perimeter of groundwater monitoring well FC9, (borings FC9-SB01 through FC9-SB06) with a push-probe drilling rig.

EHSI submitted soil samples from the six borings to Friedman and Bruya, Inc. (F&BI) of Seattle, Washington for analyses. F&BI analyzed the soil samples for the presence of diesel- to oil-range TPH by Ecology Test Method NWTPH-Diesel Extended (Dx).

EHSI field personnel found no evidence of soil staining or chemical odors during field screening of soil samples collected from the soil borings. No measureable concentrations of diesel- to oil-range TPH were detected above laboratory reporting limits (250 ppm) in any of the samples from the FC9 area soil borings.

EHSI personnel collected groundwater samples from the FC9 monitoring well. The groundwater samples were analyzed for diesel- to oil-range TPH, Volatile Organic Compounds (VOCs), and Polynuclear Aromatic Hydrocarbons (PAHs) by ESN Northwest Laboratory, Inc. (ESN).

No measureable concentrations of diesel- to oil-range TPH were detected in the soil samples submitted for analysis from monitoring well FC9 Area.

No measureable concentrations of diesel- to oil-range TPH, PAHs, or VOCs were detected in the groundwater samples submitted for analysis from monitoring well FC9.

In order to confirm that the FC9 area soil analytical results were a viable indication of the absence of petroleum hydrocarbon contamination, EHSI utilized the Ecology MTCA Stat 97 Module to assess the soil chemical data. The Ecology MTCA Stat 97 is a statistical analysis tool for Model Toxics Control Act site cleanup work. More specifically, it is a calculating compliance statistics MS Excel spread sheet for analyzing background data. Analytical results

for the six soil samples collected from borings in the area of monitoring well FC9 and that for the Herrera 2000 soil sample (FC9-S2-5) were inputted onto the Ecology MTCA Stat 97 Module. Ecology MTCA Stat 97 Module results indicated that the Uncensored Mean Value for the soil samples from the FC9 area was 585.71 ppm. In addition, the calculated Lognormal Mean Standard Deviation Median was 516.83 ppm. Statistical analyses results indicated that the probable soil heavy oil-range TPH in soils within the FC9 area were below MTCA Method A Soil Cleanup Levels for heavy oil-range petroleum hydrocarbons in Unrestricted Land Uses (2,000 ppm).

1 INTRODUCTION

This report documents a Supplemental Soil and Groundwater Sampling of the FC9 Area with the US General Services Administration (GSA) Federal Center South property (Figure 1). The FC9 Area is located within the asphalt-paved parking lot west of the Federal Center South Building 1202 (Figure 2). EHSI executed the soil characterization and groundwater well sampling project on behalf GSA in order to address the Federal Center South VCP environmental characterization data gaps.

1.1 BACKGROUND

Groundwater monitoring well FC9 was installed by Herrera Environmental Consultants as part of their *Environmental Site Assessment and Ground Water Monitoring, Federal Center South, 4735 East Marginal Way South, Seattle, Washington (January 2000)* project.

Part of the Herrera site assessment work for the project included the placement of six soil sample borings for collection of subsurface soil samples to the east of groundwater monitoring well FC9. The samples collected from the six borings were tested for diesel- to heavy oil-range petroleum hydrocarbons. There were three detections of heavy oil-range petroleum hydrocarbons. Two samples (FC9-S4-5 and FC9-S6-5) had measureable concentrations of heavy oil-range petroleum hydrocarbons of 100 and 230 ppm, respectively. Sample FC9-S2-5 had a measureable concentration of heavy oil-range petroleum hydrocarbons of 2,600 ppm. The FC9-S2-5 sample heavy oil-range petroleum hydrocarbons concentration exceeded the Washington State MTCA Method A Soil Cleanup Levels for heavy oil-range petroleum hydrocarbons in Unrestricted Land Uses (173-340 WAC).

1.2 PROJECT OBJECTIVES

The goals of the Supplemental Soil and Groundwater Sampling were to define the nature and extent of TPH in soils and groundwater within the FC9 Area. To achieve this goal, EHSI advanced a series of five soil test probes and collected and analyzed soil and groundwater samples from potential contaminant receptor areas surrounding groundwater monitoring well FC-9.

1.3 REPORT ORGANIZATION

This report begins with a Summary of Findings. Subsequent sections present the results of the Supplemental Soil and Groundwater Sampling. Two figures, four tables, and two supporting appendices follow the main text. Appendix A contains the boring logs, copies of the analytical reports are provided in Appendix B, and a copy of the Ecology MTCA Stat 97 Module printout is included in Appendix C:.

2 GENERAL DOCUMENTATION

EHSI field geologist documented daily field activities in a bound serialized field book. Information pertaining to personnel on-site, weather, general activities planned and performed, and any problems experienced on-site were recorded.

2.1 UTILITY LOCATE SURVEY

The utility survey did not disclose the presence of buried utility lines at any of the six soil probe locations.

2.2 TEST PROBES

EHSI retained Cascade Drilling, Inc. (Cascade) of Woodinville, Washington to provide direct-push probe drilling services. Cascade, under the direction of EHSI, advanced six soil test probes at potential contaminant source and receptor locations (Figure 2). EHSI collected continuous soil samples from each probe to a maximum depth of 10 feet below ground surface (BGS).

2.3 TEST PROBE LOCATIONS

In order to determine if the FC9-S2-5 sample was indicative of a pocket of undocumented soil contamination, EHSI placed six soil borings in the FC9 Area (Figure 2).

2.4 BORING LOGGING

Soils encountered at test probes FC9-SB01 through FC9-SB06 were logged by an EHSI geologist and in accordance to the Unified Soil Classification System (USCS). Copies of the boring logs are provided in Appendix B.

2.5 SUBSURFACE SAMPLING

A truck-mounted AMS Power Probe sampler was used to collect the individual soil samples. EHSI collected soil samples (Table 1) from test probe borings FC9-SB01 through FC9-SB06 (Table 2).

Soil samples were placed into laboratory-prepared 4 oz. jars. During logging operations the soil samples were screened in the field utilizing a photovoltaic ionization detector (PID) to test for the presence of VOCs in the samples.

2.6 SOIL SAMPLING DOCUMENTATION

EHSI documented all field activities associated with soil sampling. Documentation included a comprehensive discussion of field observations, such as field parameter measurements, and documentation of any problems encountered in the field. All soil sample containers were labeled with the following information:

- EHSI project identification number;
- Sample date;
- Sampler's name; and
- Sample identification number.

Each soil sample collected was given a unique identification number as described below:

Boring Number \Sample Depth: For example, sample FC9-SB01 is the sample collected from soil boring FC9-SB01-02.

In addition, the sample chain-of-custody forms were completed with EHSI project identification number, the sampler's name, date, and sample identification codes, number of containers, and date and time the sample was collected. The chain-of-custody form was included with samples transported to the analytical laboratory.

2.7 DECONTAMINATION PROCEDURES

All non-disposable sampling equipment was decontaminated prior to and after each sampling operation. The specific steps used for decontamination of the equipment are:

- Rinse and pre-clean equipment in potable water;
- Wash and scrub equipment with non-phosphate based detergent and potable water;
- Rinse with potable water;
- Rinse in deionized water; and
- Air-dry and store in clean plastic bags (or visqueen sheet) between samplings.

2.8 GROUNDWATER SAMPLING PROCEDURE

EHSI collected groundwater samples from well FC-9. Prior to groundwater sampling, the static water level was recorded from the well. The static water level was measured in the well relative to the top of its well casing (TOC) using an electronic water level meter. Well FC9 was purged between three and five well casing volumes of stagnant water using clean, dedicated polyethylene tubing and a decontaminated battery-operated low flow purge pump. After purging the well, groundwater was allowed to recover in the well before collecting a groundwater sample using a dedicated disposable bailer. After sample retrieval, the water in the bailer was transferred directly into sample containers provided by the analytical laboratory. The date and time of each sample collected was recorded in the field notebook and on the chain-of-custody form.

2.9 SAMPLE HANDLING AND TRANSPORT

EHSI field personnel checked all sample containers for completeness and cap tightness. The sealed sample containers were then placed upright in a cooler chilled with Blue Ice. The sample cooler was then placed in a field vehicle to await transportation to the analytical laboratory. All soil samples collected were transported, under chain-of-custody to F&BI for analyses. The groundwater samples collected were transported, under chain-of-custody to ESN for analyses.

2.10 SOIL SAMPLE ANALYSES

Six soil samples were submitted under chain-of-custody protocol to F&BI for analysis. F&BI analyzed the soil samples for the presence of diesel- to oil-range TPH by Ecology Test Method NWTPH-Dx.

2.11 GROUNDWATER SAMPLE ANALYSES

The monitoring well FC9 groundwater samples were submitted under chain-of-custody protocol to ESN in Bellevue, Washington for chemical analysis. The samples were analyzed for the presence of diesel-range to lube oil-range organics in water by test method NWTPH- Diesel Dx. The groundwater samples were also tested for the presence of VOCs using EPA Test Method 8260C. The samples were analyzed for the presence of PAHs in water by test method 8270.

3 INVESTIGATION RESULTS

3.1 SUBSURFACE CONDITIONS

The subsurface materials observed at test probe locations FC9-SB01 through FC9-SB06 were made up of the following lithology. The upper six feet are made up of fill material that is primarily a tan fine-grained sand. The fill materials change to a dark gray sand from approximately six to eight feet BGS. Below eight feet BGS the lithology changes to native materials consisting of organic clays and silts (OH). Details on the shallow subsurface geology are documented in the soil boring logs that are provided in Appendix B.

3.2 GROUNDWATER

During probing, a saturated zone indicative of the uppermost groundwater table was encountered at approximately six feet BGS.

3.3 FIELD OBSERVATIONS

EHSI screened soils from borings FC9-SB01 through FC9-SB06 with a PID to check for the presence of VOCs. The soil samples collected from the test probes did not have measurable PID readings. EHSI field personnel found no evidence of soil staining or chemical odors during field screening of soil samples collected from the soil borings.

4 ANALYTICAL RESULTS

4.1 ANALYTICAL RESULTS SOILS

Analytical results for the FC9 Area soil boring samples indicated that no measureable concentrations of diesel- to oil-range TPH were detected above the test method laboratory reporting limits. The Test Method NWTPH-Dx detection limits for diesel- to oil-range TPH are 50 and 250 ppm, respectively. Copies of the laboratory analytical report and chain-of-custody forms are provided in Appendix B.

4.2 ANALYTICAL RESULTS GROUNDWATER

Groundwater analytical results for monitoring well FC9 samples indicated that no measureable concentrations of diesel- to oil-range TPH, VOCs, or PAHs were detected above the individual test method laboratory reporting limits. Copies of the laboratory analytical report and chain-of-custody forms are provided in Appendix B.

5 REGULATORY REVIEW

The soil and groundwater sample analytical results were compared to the MTCA Method A Soil Cleanup Levels for diesel- to oil-range TPH, VOCs, and PAHs in Unrestricted Land Uses and MTCA Method A Groundwater Cleanup Levels. State regulators and environmental professionals use MTCA Cleanup Levels to compare levels of contamination in soil and groundwater. The MTCA Cleanup Levels are the concentrations standards where (if exceeded) the State of Washington regulators judge a soil or groundwater sample to be contaminated.

The MTCA Method A Soil Cleanup Level for diesel- to oil-range TPH is 2,000 ppm. The MTCA Method A Groundwater Cleanup Level is 500 µg/L (parts per billion). The MTCA Method A Cleanup Levels for VOCs and PAHs vary depending on the particular VOC or PAH species. None of the analyzed soil or groundwater samples from the FC9 Area soil or monitoring well FC9 groundwater exceeded the MTCA Cleanup Levels for the respective chemical species (Tables 3, 4, and 5).

6 SOIL SAMPLE STATISTICAL ANALYSIS

In order to confirm that the FC9 area soil analytical results were a viable indication of the absence of petroleum hydrocarbon contamination, EHSI utilized the Ecology MTCA Stat 97 Module to assess the soil chemical data. The Ecology MTCA Stat 97 is a statistical analysis tool for Model Toxics Control Act site cleanup work. More specifically, it is a calculating compliance statistics MS Excel spread sheet for analyzing background data. Analytical results for the six soil samples collected from borings in the area of monitoring well FC9 and that for the Herrera 2000 soil sample (FC9-S2-5) were inputted onto the Ecology MTCA Stat 97 Module.

Ecology MTCA Stat 97 Module results indicated that the Uncensored Mean Value for the soil samples from the FC9 area was 585.71 ppm. In addition, the calculated Lognormal Mean Standard Deviation Median was 516.83 ppm. Statistical analyses results indicated that the probable soil heavy oil-range TPH in soils within the FC9 area were below MTCA Method A Soil Cleanup Levels for heavy oil-range petroleum hydrocarbons in Unrestricted Land Uses (2,000 ppm). A copy of Ecology MTCA Stat 97 Module output sheet is provided in Appendix C.

7 CONCLUSIONS

The test results for FC9 Area test probe locations samples contained no measurable concentrations of diesel- to oil-range TPH.

Statistical analyses results indicated that the probable soil heavy oil-range TPH in soils within the FC9 area were below MTCA Method A Soil Cleanup Levels for heavy oil-range petroleum hydrocarbons in Unrestricted Land Uses (2,000 ppm).

Testing of groundwater samples from monitoring well FC9 confirmed that groundwater within the well area is compliant with MTCA Method A Groundwater Cleanup Levels for diesel- to oil-range TPH, VOCs, and PAHs.

EHSI has concluded and soil test data has confirmed that the soils in the FC9 Area are free of petroleum hydrocarbon contamination. Similarly, groundwater samples indicate that the uppermost water bearing unit of the Federal Center South property, in the vicinity of groundwater monitoring well FC9 is free of petroleum hydrocarbon, VOC, and PAH contamination.

8 RECOMMENDATIONS

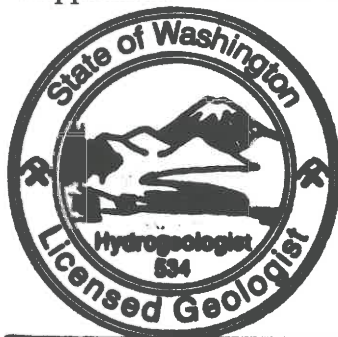
With the execution of this project, we believe that the concerns regarding potential soil and groundwater contamination in the Federal Center South FC9 area have been resolved. At this point we believe that no further investigation of this portion of the Federal Center South property is warranted.

9 REFERENCES

Jones, M. A.; 1998, "Surficial Hydrogeologic Units of the Puget Sound Aquifer System, Washington"; United States Geological Survey Professional Paper.

10 SIGNATURES

This Supplemental Soil and Groundwater Sampling was prepared by the undersigned.



Miguel A. Ortega


Miguel A. Ortega, L.G.


Date

Washington Licensed Geologist (Hydrogeology Specialty); License #534.

11 LIMITATIONS

The conclusions presented in report are professional opinions based upon our visual observations and physical testing. This report is intended exclusively for the purpose outline herein and at the site location and project indicated. This report is for the sole use of our client, the US General Services Administration. Opinions and conclusions presented herein apply to site conditions existing at the time of execution of our Supplemental Soil and Groundwater Sampling and do not necessarily apply to future changes or other prior conditions at the site of which EHSI is not aware and has not had the opportunity to evaluate. The scope of services performed in execution of this Supplemental Soil and Groundwater Sampling may not be appropriate to satisfy the needs of other users, and any use or re-use of the document or the findings, conclusions, or recommendations presented is at the sole risk of the said user.

EHSI's objective is to perform our work with care, exercising the customary thoroughness and competence of environmental consulting professionals in the relevant disciplines. Furthermore, we carried out our services in accordance with the standard for professional services by a consulting firm at the time those services were rendered. It is important to recognize that even the most comprehensive scope of services may fail to detect environmental liability on a particular site. Therefore, EHSI cannot act as insures and cannot "certify or underwrite" that a site is totally free of environmental liability. In addition, no expressed or implied representation or warranty is included or intended in our report except that our work was performed within the limits prescribed by our client, and with the customary thoroughness and competence of our profession.

FIGURES

TABLES

TABLE 1: SOIL SAMPLE SOURCE INFORMATION		
SOIL SAMPLE	SOURCE LOCATION	SAMPLE DEPTH (FEET BGS¹)
FC9-SB1-02	Probe FC9-SB1 located eleven feet northeast of groundwater monitoring well FC9	6.1
FC9-SB2-02	Probe FC9-SB2 located 11 feet southeast of groundwater monitoring well FC9	6.3
FC9-SB3-02	Probe FC9-SB3 located 13 feet north of groundwater monitoring well FC9	5.8
FC9-SB4-02	Probe FC9-SB4 located 11 feet northwest of groundwater monitoring well FC9	5.9
FC9-SB5-02	Probe FC9-SB5 located eight feet west of groundwater monitoring well FC9	5.8
FC9-SB6-02	Probe FC9-SB6 located six feet south of groundwater monitoring well FC9	5.9

EXPLANATION¹BGS-Below Ground Surface

TABLE 2: GROUNDWATER SAMPLE SOURCE INFORMATION	
GROUNDWATER SAMPLE	SOURCE LOCATION
FC9	Groundwater monitoring well FC9

TABLE 3: SOIL ANALYTICAL RESULTS NWTPH-Dx¹		
Soil Sample ID and Sample Depth	NWTPH-Diesel Range (mg/kg) ²	NWTPH- Motor Oil Range (mg/kg) ²
MTCA METHOD A CLEANUP LEVEL ³	2,000	2,000
FC9-SB1-02	ND	ND
FC9-SB2-02	ND	ND
FC9-SB3-02	ND	ND
FC9-SB4-02	ND	ND
FC9-SB5-02	ND	ND

EXPLANATION

¹NWTPH-Diesel Extended (Dx), Washington State Department of Ecology Test Method for quantifying the presence of diesel- to oil-range total petroleum hydrocarbons (TPH);

²Analytical values reported in milligrams per kilograms (mg/kg);

³Washington Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels For Unrestricted Land Uses (WAC 173-340-745); and

⁴ND - Not Detected, below test method detection limit of 50 mg/kg for diesel-range TPH and 250 mg/kg for motor oil-range TPH mg/kg.

TABLE 4: GROUNDWATER SAMPLE ANALYTICAL RESULTS ¹NWTPH-DIESEL EXTENDED AND BTEX²					
GROUNDWATER SAMPLE ID	NWTPH-Dx ² (µg/L) ³	Benzene ³ (µg/L)	Toluene ³ (µg/L)	Ethylbenzene ³ (µg/L)	Xylenes ³ (µg/L)
FC9	ND ⁶	ND	ND	ND	ND
MTCA METHOD A CLEANUP LEVELS ⁵	500	5	700	1,000	1,000

EXPLANATION

¹NWTPH-Diesel Extended (Dx), Washington State Department of Ecology Test Method for quantifying the presence of diesel- to oil-range total petroleum hydrocarbons (TPH);

²Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX), by EPA Test Method 8260C;

³Analytical values reported in micrograms per liter (µg/L); and

⁴Washington Model Toxics Control Act (MTCA) Method A Groundwater Cleanup Levels;

⁵ND - Not Detected, below test method detection limit of 250 µg/L for diesel-range TPH, 500 µg/L for oil-range TPH, benzene (1 µg/L), toluene (1 µg/L), ethylbenzene (1 µg/L), and total xylenes (3 µg/L).

**TABLE 5: GROUNDWATER SAMPLE ANALYTICAL RESULTS
POLYNUCLEAR AROMATIC HYDROCARBONS¹**

GROUNDWATER SAMPLE ID	FC9
ANALYTE	RESULTS²
Acenaphthene	Not Detected (ND) ³
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenzo(a,h)anthracene	ND
Fluorene	ND
Fluoranthene	ND
Indeno(1,2,3-cd)pyrene	ND
Naphthalene	ND
1-Methylnaphthylene	ND
2-Methylnaphthylene	ND
Phenanthrene	ND
Pyrene	ND

EXPLANATION

¹EPA Method 8270, USEPA Test Method for quantitative testing of Polynuclear Aromatic Hydrocarbons;

²Analytical values reported in micrograms per liter (µg/L);

³ND - Not Detected, below test method detection limit of 0.1 µg/L for all analytes;

APPENDIX A: BORING LOGS

APPENDIX B: COPIES OF ANALYTICAL REPORTS

APPENDIX C: ECOLOGY MTCA STAT 97 MODULE RESULTS